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Translating climate beliefs into action in a changing political landscape

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Abstract

Political leaders can influence public beliefs about climate change, and climate beliefs can influence climate actions. But, much is still unknown about (1) whether changes in political landscapes influence public's climate beliefs and (2) the psychological process through which climate beliefs influence pro-environmental sentiments and actions. Achieving a better understanding these influences are the dual purposes of this paper, we investigated during the unique setting of the 2016 US presidential elections. First, we explored to what extent the American public's belief in the anthropogenic origins and negative impacts of climate change were influenced by the 2016 US presidential election and earliest administrative days of a climate-skeptical political leader, Donald Trump. We found Trump's influence on public climate beliefs may have increased after his election in such a way that may have polarized public climate beliefs. Compared with pre-election levels, supporters' climate beliefs grew weaker and, further, opponents' climate beliefs grew stronger after his election. Second, we tested a novel conditional mediation model that proposes climate beliefs interact to exert their influence on climate actions via moral behavioral sentiments. Specifically, we found people's origin and impact climate beliefs interact to influence climate actions by activating moral sentiments about their own environmental behavior (i.e., guilt, striving to be a better person), with the particularly weak moral sentiments reported by those with both weak belief in climate change's anthropogenic origins and its negative impacts. Moral sentiments, in turn, predicted respondents' willingness to save energy to reduce climate change and their support for the Paris Climate Agreement. These results suggest the election of climate-skeptical political leaders can impact the public's climate beliefs. Moreover, climate beliefs interact to influence the moral sentiments people feel about their own behavior, and consequently, influence their climate-friendly behavioral intentions and policy preferences.

Keywords Climate beliefs · Behavioral intentions · Policy support · Elite influence · Elections

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Climate change is one of the most pressing environmental issues of our time. The IPCC 1.5 °C special report (2018) made clear that to limit climate change to 1.5 °C, urgent and rapid actions are needed, and both climate mitigation policies and individual behavior changes are crucial. However, despite the general scientific (IPCC 2018) and public (Steg 2018) consensus about the existence and human causes of climate change, notable climate skeptics have risen to political prominence over the past few years (e.g., Contestabile 2018). Political leaders play a critical role in climate change mitigation, not only via climate policies and international negotiations but also by influencing the general public's beliefs about climate change (Brulle et al. 2012; Hahnel et al. 2019; Hahnel and Brosch 2016; Nisbet and Kotcher 2009). In turn, climate beliefs might affect individuals' climate actions, including climate-friendly behavior and policy preferences (e.g., Dietz et al. 2015; Sohlberg 2016; Moser 2009).

Climate beliefs reflect many aspects of what people think about climate change, such as the extent to which people think climate change is caused by human actions rather than natural causes (i.e., origin belief) and that the impacts of climate change will be mostly negative rather than positive (i.e., impact belief; Ding et al. 2011; Weber 2016). Political leaders' influence on public climate beliefs means the more climate-friendly or skeptical a political leader's messaging and outspoken positions, the more climate-friendly or skeptical (respectively) the leader's supporters are likely to be (Brulle et al. 2012; McDonald 2009; Sohlberg 2016). However, while the influence of prominent leaders on public climate beliefs are clear, what is not yet known is how that influence may change during an election—when a political leader rises to power.

Additionally, origin and impact climate beliefs are consistent predictors of climate actions (Ding et al. 2011; Hornsey et al. 2016). The stronger an individuals' origin and impact climate beliefs, the more likely they are to perform climate-friendly behaviors and support climate-friendly policies. However, researchers have not yet identified whether and how climate beliefs might interact and work together to influence climate actions.

Therefore, the goals of the present research are twofold: (1) detect whether a climate-skeptical leader's influence on public climate beliefs changes as they rise to power and (2) identify the psychological process through which climate beliefs may have “downstream” consequences for climate actions. Specifically, we first examine whether the election of Donald Trump, a well-known climate skeptic (Lehmann 2016; Matthews 2017), as President of the USA influenced the US public's climate beliefs. Then second, we propose and test a conditional mediation model that explains how the public's climate beliefs may interact to influence their climate actions by activating sentiments they feel about their own behavior.

1 Climate-skeptical political leaders and public climate beliefs

Political leaders influence public climate beliefs, especially among their supporters (Krosnick et al. 2000). Meaning, leaders' climate communications may be most effective among people who already support them and are therefore receptive to the leaders' positions and messaging. One explanation for this may come from social identity theory, from which one could infer that people are more likely to align their beliefs with a leader with whom they strongly identify and which they support (Bouman and Steg 2019; Fielding and Hornsey 2016; Hahnel and Brosch 2016; Hogg et al. 2012). In the context of climate-skeptical political leaders, this would mean the more people identify with and support an openly climate-skeptical leader, the weaker their personal climate beliefs are likely to be. It is also

possible that people who actively oppose the leader might also be influenced by the leader, but in the opposite direction. Meaning, in order to distance themselves from an openly climate-skeptical leader and his/her followers, those opposed to the leader may express stronger climate beliefs. Consequently, we interviewed both Trump supporters and opponents to explore whether or not Trump's influence may extend beyond his immediate supporters.

Another important factor to consider regarding political leaders' influence on public climate beliefs is that their status within society changes over time, as is the case of winning or losing an election. Changing status may also change their influence on their constituents' climate beliefs. Being elected President, for example, grants a political leader the highest possible status and authority within their party and country. This newly gained higher status may strengthen their influence over public beliefs because individuals with greater status, authority and power are more likely to influence others (Cialdini 2009; c.f., Brauer and Bourhis 2006; Nisbet and Kotcher 2009). Therefore, in the context of climate change, we propose that leaders' influence on public climate beliefs is likely to grow stronger after they are elected, compared with pre-election levels.

Given the rise to political prominence of numerous climate skeptics over the past few years (e.g., Johnson 2015; Lehmann 2016; Matthews 2017; Tollefson 2018), it is important to understand what influence the rise of a climate-skeptical political leader to President has on public climate beliefs. In the present study (described in more detail below), we surveyed Americans before Donald Trump's, a climate-skeptical political leader, 2016 election as President of the USA and at multiple time points during the early months of his presidency. By collecting data before and after his election, we can examine not only the influence he had on Americans' climate beliefs but also how that influence may have changed once he was elected President. Based on our reasoning above, we propose a two-way interaction such that a climate-skeptical leader will more strongly affect climate beliefs when in power (c.f., Brauer and Bourhis 2006; Cialdini 2009; Nisbet and Kotcher 2009), particularly among those who support the leader (c.f., Fielding and Hornsey 2016; Hahnel and Brosch 2016). Specifically, we hypothesized:

H1: Higher support for Trump would predict weaker origin and impact climate beliefs and, importantly, this relationship would grow stronger after Trump was elected to President of the USA, compared with before the election.

2 How climate beliefs translate into climate actions

Because stronger climate beliefs are associated with increased likelihood to perform climate actions (Ding et al. 2011; Hornsey et al. 2016), our second research question is on how climate beliefs affect climate behaviors and policy preferences. Despite the consistent evidence that climate beliefs are positive predictors of climate actions (for a meta-analysis, see Hornsey et al. 2016), relatively little is known about the underlying psychological process that drives the relation between climate beliefs and actions, such as how (mediators) and when (moderators) this influence is most likely to occur (Nisbet and Scheufele 2009). We aim to address this gap in the literature by proposing and testing the notion that climate change beliefs interact with each other to influence how people feel about their own climate-related behavior, and in turn, predict climate actions.

Climate change beliefs interact to influence climate actions

As mentioned previously, climate beliefs are multi-faceted, and while these beliefs do often influence each other (e.g., van der Linden et al. 2015), people can hold multiple climate beliefs simultaneously to various strengths. All of the core climate beliefs (i.e., existence, origin, and impact beliefs) have positive relations with climate actions (i.e., Ding et al. 2011; Hornsey et al. 2016; Nisbet and Scheufele 2009): the more strongly someone believes climate change is human-caused or that its impacts will be negative, the more likely that person is to perform climate actions.

While research has well established that each of these types of climate beliefs independently predict individuals' climate-related actions, it has yet to examine how different climate beliefs might interact when influencing climate actions. For example, someone can have strong beliefs about the anthropogenic origins of climate change (i.e., strong origin belief) and at the same time, think that climate change will have (almost) no, or even positive, impacts (i.e., weak impact belief; Weber 2016). In such cases, it is unclear to what extent the relation between one climate belief and climate actions may depend on the relative strength of other climate beliefs the person holds.

We propose that the influence of belief in the origin of climate change on climate-friendly actions may depend on the strength of belief in the impact of climate change. Recent theorizing on the role of risk perceptions in understanding climate beliefs and actions critiques the "one size fits all" approach to conceptualizing climate beliefs (Weber 2016). Instead, they argue a person who strongly believes that climate change is human-caused, but at the same time does not perceive climate change as risky (for our purposes, has a weak impact belief), may be less inclined to engage in climate-friendly actions than someone with both strong origin and impact beliefs. In other words, a strong belief in the anthropogenic origins of climate change alone may not be enough to promote climate actions. Instead, it is more likely that people perform climate actions if they not only believe climate change is human-caused but also hold strong beliefs that the impacts of climate change will be negative (cf., Weber and Stern 2011).

Similarly, if people strongly believe climate change will have negative impacts, but believe climate change is a natural phenomenon (i.e., weak origin belief), they may be less likely to perform climate actions. In such cases, people may be less inclined to act because they perceive climate change as "not my fault" and therefore do not see why they should be the ones to act on climate change. There is evidence that similar parallel processes may occur for individual climate behaviors: downplaying one's role in contributing to climate change can inhibit climate action. For example, research on flying behavior has shown that people are less likely to perform climate-friendly behaviors when they think it's not their place to personally act to mitigate climate change (Becken 2007). Meaning, the lack of a sense of personal responsibility can inhibit climate change actions (for a review, see Pidgeon 2012), even among people who agree that climate change poses a global threat. Therefore, we hypothesized:

H2: Climate beliefs interact to impact climate action in such a way that their influence on climate actions may be particularly powerful when a person holds the combination of both a strong belief that climate change is a problem (i.e., strong impact belief) plus a strong belief that people are responsible for that problem (i.e., strong origin belief).

Moral behavioral sentiments translate climate beliefs into actions We further propose that climate beliefs will mostly affect climate actions indirectly, by activating moral emotional

states that motivate climate actions (cf., Bouman et al. 2020; Stern 2000; van der Werff and Steg 2016; Weber 2010; Weber 2016). Our reasoning is based on research which shows general predictors of behavior (e.g., biospheric values) affect moral sentiments about behavior (e.g., feeling guilty when not acting pro-environmentally or feeling that acting pro-environmentally would make one a better person; from here out referred to as *moral behavioral sentiments*), which in turn affect pro-environmental actions (cf., Stern 2000; Stern et al. 1999; van der Werff and Steg 2016). The moral aspect of these sentiments may be particularly motivating because they provide a reason to act climate-friendly (i.e., it is the right thing to do), even when climate behaviors are somewhat costly or uncomfortable to do (van der Werff et al. 2013).

There is some evidence that the stronger people's climate beliefs are, the stronger they feel moral sentiments about their climate-related behaviors (Dietz et al. 2007). In turn, several studies have shown that moral behavioral sentiments are related to climate behaviors (Bamberg and Möser 2007; Harland et al. 1999) and policy support (Steg et al. 2011). However, despite the evidence that climate beliefs are consistent general predictors of climate actions and that moral behavioral sentiments often mediate the relations between general predictors and climate actions, to our knowledge no one has yet explicitly tested whether or not the moral behavioral sentiments mediate the relation between climate beliefs and actions. Therefore, we hypothesized:

H3: The relation between both types of climate beliefs, their interaction, and climate actions would be mediated by moral behavioral sentiments, such that stronger origin and impact climate beliefs would elicit stronger moral sentiments about one's own personal behavior. Subsequently, stronger moral behavioral sentiments would be positively associated with climate-friendly behavioral intentions and policy preferences (see Fig. 1).

In sum, we extend the literature by testing the psychological process through which climate beliefs interact to influence climate actions via moral behavioral sentiments (Fig. 1). Furthermore, by testing the model during the rise of a climate-skeptical political leader, we conduct a unique robustness test of our model to determine if our reasoning holds when climate-skeptical political leaders' may influence public climate beliefs. In order to account for Trump's influence on his supporters' climate beliefs and how that may have changed during his rise to power, we included time point, support for Trump, and their interaction in our model as covariates. By including the potential influence Trump's rise to power had on public climate beliefs in our model test, we are able to identify the variance in climate actions that is uniquely

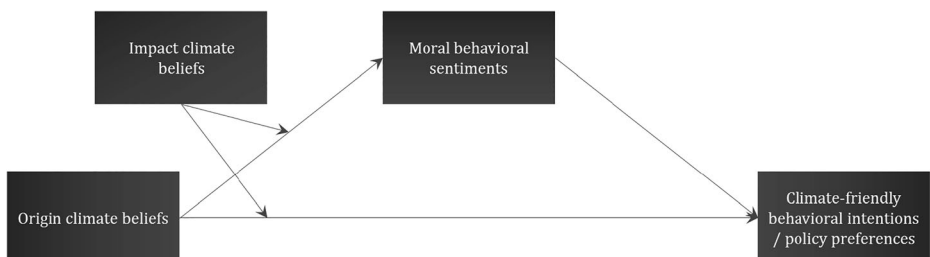


Fig. 1 Theoretical model for how origin and impact climate beliefs translate into climate actions

accounted for by our proposed theoretical process, above and beyond the direct effects of Trump's rise to power.

3 Method

We conducted questionnaire studies among four independent samples of American citizens; one sample (baseline) was collected 1 day before the 2016 US presidential election and the other three samples were collected at three critical time points during the Trump administration that coincided to high-profile climate-related policy decisions made by the administration (Time 2 and Time 4) or were considered important policy benchmarks for the administration (Time 3). Time 1 was the day before to the 2016 election (baseline). Time 2 was 20 days into Trump's administration, at that time Executive Orders which had harmful consequences for the environment and climate change had been implemented (Trump 2017). Time 3 was 100 days into Trump's presidency, an important cultural landmark in US politics for reflecting on a President's political accomplishments. Time 4 was 10 days after Trump withdrew the USA from the Paris Climate Agreement, which benchmarks critical international guidelines and greenhouse gas emission goals (UNFCCC 2019). The data were aggregated and assessed for use in a pooled cross-sectional analysis, an approach that is appropriate for comparing data collected from independent samples (Kessler and Greenberg 1981). Data reported here were collected as part of a larger multi-purpose study. Below, we explain the measures reported in this paper, reflecting the key concepts in our model and the key covariates we introduced.¹

3.1 Recruitment and data quality assessment

Four independent samples completed an online questionnaire at for separate time points for a total of 1827 respondents ($N_{\text{Time1}} = 469$, $N_{\text{Time2}} = 449$, $N_{\text{Time3}} = 457$, $N_{\text{Time4}} = 452$). Respondents were recruited via MTURK, an adult convenience sample from the USA that has been shown to be appropriate for public opinion studies (Clifford et al. 2015), and were compensated with US \$0.75 payment. To insure independence of samples, each wave of data collection was only available to respondents who had not completed previous questionnaires.

All four samples were assessed on multiple aspects of data quality.² We chose a cleaning scheme that preserved as many respondents as possible while still ensuring high data quality. We removed 58 (3.2%) respondents for failing to pass an invariance test (i.e., "straight-lining" a series of questions with the same response options, producing a standard deviation of 0) on two large grid-style questions ($SD = 0$; $N = 48$, 2.6%) or because they were not US citizens (and therefore ineligible to vote in the 2016 election, $N = 10$, 0.5%). Two participants failed both criteria. This left a final N of 1769 participants ($N_{\text{Time1}} = 452$, $N_{\text{Time2}} = 437$, $N_{\text{Time3}} = 442$, $N_{\text{Time4}} = 438$). No significant differences were found across samples on all data quality measures.

¹ The full questionnaire is available upon request from the first author.

² We also examined data quality based on three other criteria: attention checks (three checks per sample, identical wording and placement in all samples), speeding (time of completion), and inconsistency across questions (e.g., not believing in climate change, yet thinking it will have a bad impact on humanity). Crosstabs analyses were conducted to identify which participants failed most of the data quality checks. Ultimately, for all four samples, invariance was found to reliably overlap with failing other data quality checks and therefore was used as our primary data cleaning indicator.

One-way ANOVAs of sociodemographics (gender, age, political orientation, and party affiliation) revealed no significant differences across samples, and the variances on our target measures were similar for all time points (see Table 1). As a result, the samples were considered highly comparable and pooled for model testing (Kessler and Greenberg 1981; c.f., Zawadzki et al 2017).

3.2 Procedure and measures

The procedure was similar for all samples. Respondents answered questions on their climate-friendly behavioral intentions, beliefs about the human causes of climate change, beliefs about climate change's negative impacts, moral behavioral sentiments, climate-friendly policy preferences, and support for Donald Trump, in that order (see Table 1 for descriptive statistics). Throughout the questionnaire, respondents were asked demographics questions, including gender, age, political orientation, party affiliation, and status as a US citizen.

Origin: climate belief Respondents reported “to what extent do you think that climate change is caused by human activity? (e.g., CO₂ emissions, burning of fossil fuels)” on a scale of 1 “not at all” to 7 “completely,” with an option for “I don’t think climate change is happening” ($N = 44$, 2.5%) coded as missing data.

Impact: climate belief Respondents went on to report “how bad or good do you think the potential impact of climate change will be on people across the world?”. Scores could vary from 1 “very bad” to 7 “very good” (reverse coded), with an option for “I don’t think climate change is happening” ($N = 65$, 3.7%)³ coded as missing data.

Moral behavioral sentiments Respondents completed two items of moral sentiments about their environmental behavior. These items were selected based on their conceptual similarity to key moral sentiments linked with pro-environmental engagement in the literature (i.e., anticipated guilt and positive feelings related to environmental behavior; Bamber and Möser 2007; Harland et al. 1999; Swim and Bloodhart 2013; van der Werff et al. 2013). Specifically, respondents were asked about the extent to which they agree with “I would feel guilty if I did not act in an environmentally friendly manner,” and “I would be a better person if I would act in an environmentally friendly manner.” Both items included a 7-point Likert scale, with end-points labeled as 1 “strongly disagree” to 7 “strongly agree.”

Climate-friendly behavioral intentions Respondents read a brief introduction about how many people try to save energy but for different reasons. Among filler reasons (e.g., saving money, benefitting national health), they were then asked “to what extent are you willing to save energy for the sake of reducing climate change?” Responses could vary from 1 “not at all” to 7 “completely.”

Climate-friendly policy preferences Respondents indicated the extent to which they think the USA should abide by the provisions of the Paris Climate Agreement; responses could vary

³ The slightly higher climate change existence denial in this response may reflect participant response error. All participants received all questions, and responses were checked for consistency. If participants answered “I do not believe” to either question, they were counted as missing data and removed from analysis.

Table 1 Sample characteristics and descriptive statistics of study variables at each time point

	Time 1	Time 2	Time 3	Time 4
Date of data collection	Nov. 7, 2016	Feb. 8, 2017	Apr. 28, 2017	June 12, 2017
<i>N</i>	452	437	442	438
Sociodemographics				
Gender: <i>N</i> (%)				
Men	209 (46.2%)	203 (46.5%)	187 (42.3%)	204 (46.6%)
Women	243 (53.8%)	234 (53.5%)	255 (57.7%)	234 (53.4%)
Age				
Mean (SD)	37.90 (11.91)	38.11 (12.95)	38.23 (12.52)	37.04 (12.30)
Min (max)	19 (74)	18 (81)	19 (88)	18 (92)
Relevant political demographics				
<i>Political orientation</i> “Please choose the option that best describes your political orientation”: <i>N</i> (%)				
Very much liberal, Liberal, or Somewhat liberal	257 (56.9%)	260 (59.5%)	260 (58.8%)	273 (62.3%)
Very much conservative, conservative, or somewhat conservative	188 (41.6%)	177 (40.5%)	179 (40.5%)	165 (37.7%)
<i>Party affiliation</i> : <i>N</i> (%)				
Democrat	183 (40.5%)	189 (43.2%)	196 (44.3%)	195 (44.5%)
Republican	114 (25.2%)	107 (24.5%)	113 (25.6%)	98 (22.4%)
Independent	137 (30.3%)	128 (29.3%)	114 (25.8%)	128 (29.2%)
Other	12 (2.7%)	13 (3%)	18 (4.1%)	17 (3.9%)
Descriptives for study variables: mean (SD)				
Origin climate belief	5.23 (1.70)	5.22 (1.77)	5.32 (1.61)	5.49 (1.64)
Impact climate belief	5.56 (1.48)	5.57 (1.48)	5.50 (1.57)	5.79 (1.40)
Moral behavioral sentiments	5.26 (1.53)	5.10 (1.63)	5.26 (1.52)	5.31 (1.47)
Climate-friendly behavioral intentions	5.40 (1.81)	5.31 (1.91)	5.38 (1.69)	5.61 (1.68)
Climate-friendly policy preferences	5.45 (1.70)	5.33 (1.96)	5.42 (1.87)	5.35 (2.10)
Support for Donald Trump	2.72 (2.17)	2.81 (2.21)	2.66 (2.09)	2.54 (2.03)

% ages may not always add up to 100% due to missing data

from 1 “should definitely not abide” to 7 “should definitely abide,” with an option for “I don’t know about the Paris Climate Agreement” ($N = 248$, 14.0%) coded as missing data. Support for the Paris Accord was selected as our climate-friendly policy support measure because of its political contention leading up to the 2016 election, and withdrawal from the Accord was one of Donald Trump’s campaign promises (Sarlin 2016).

Support for Donald Trump Last, respondents were asked “What is your impression of Donald Trump?” from 1 “very negative” to 7 “very positive,” with an option for “I don’t know Donald Trump” ($N = 27$, 1.5%) coded as missing data.

Sociodemographics Respondents completed the demographics questions described in Table 1. All sociodemographics were measured using single item measures.

4 Results

An examination of the mean scores of both origin and impact climate beliefs suggests both origin and impact climate beliefs were relatively high in our sample, with even -1 standard deviation below the mean being near or above the midpoint for both origin and impact climate beliefs (see Table 1). This is in-line with representative polling results from the time of data collection (Brenan and Saad 2018; Leiserowitz et al. 2018; Steg 2018), which found that on the whole, belief in anthropogenic climate change tends to be relatively strong among all major demographics. The same is true even for Trump’s voters—despite supporting and voting for an outspoken critic of climate change, the most common belief among Trump voters at the time of his election was that climate change is real and happening (Leiserowitz et al. 2017). Consequently, we will refer to the *relative* extent to which origin and impact beliefs changed during Trump’s rise to power and subsequently affected moral sentiments and climate actions.

4.1 Influence of a climate-skeptical president on public climate beliefs

We first examined if higher support for Trump would predict weaker origin and impact climate beliefs and, if this relationship would interact with time point, specifically if it would be stronger after Trump was elected to President of the USA (i.e., in Times 2, 3, and 4), compared with before the election (i.e., in Time 1; H1). To that end, we conducted two multiple linear regression analyses with origin and impact beliefs as the respective outcomes, and with support for Trump, time point, and their interaction, as the predictors.

As predicted, we found a significant interaction between time point and support for Trump for both origin ($b = -.051$, $se = .015$, $p = .001$) and impact ($b = -.033$, $se = .014$, $p = .024$) climate beliefs (see Table 2). An examination of the coefficients, and corresponding confidence intervals, at each time point showed a negative association between support for Trump and origin and impact beliefs, respectively, and this association appeared stronger at time points during the Trump presidency compared with pre-election.

In order to statistically determine whether the magnitude of the relations between Trump support and climate beliefs differed significantly pre- and post-election, we calculated the

Table 2 Interactions of time point and support for Trump on origin and impact climate beliefs

Dependent variable: Origin climate belief	b	se	t	p-value		
Constant	5.836	0.140				
Time point	0.195	0.051	3.817	< 0.001		
Support for Trump	0.260	0.041	-6.324	< 0.001		
Time X Support for Trump (interaction)	0.051	0.015	-3.302	0.001		
					95% Confidence Interval for b	
<i>Post-hoc analyses: examination of slopes for Trump support at each time point</i>					Lower bound	Upper bound
Time 1: pre-election	0.278	0.036	-7.760	< 0.001	-0.349	-0.208
Time 2: 20 days after inauguration	0.407	0.034	6	< 0.001	-0.474	-0.340
Time 3: 100 days into Trump administration	0.415	0.032	3	< 0.001	-0.478	-0.352
Time 4: 10 post withdrawal from Paris Accord	0.441	0.034	8	< 0.001	-0.507	-0.375
Dependent variable: Impact climate belief	b	se	t	p-value		
Constant	5.991	0.131				
Time point	0.132	0.048	2.776	0.006		
Support for Trump	0.196	0.039	-5.047	< 0.001		
Time X Support for Trump (interaction)	0.033	0.014	-2.265	0.024		
					95% Confidence Interval for b	
<i>Post-hoc analyses: examination of slopes for Trump support at each time point</i>					Lower bound	Upper bound
Time 1: pre-election	0.192	0.033	-5.896	< 0.001	-0.257	-0.128
Time 2: 20 days after inauguration	0.296	0.031	-9.548	< 0.001	-0.357	-0.235
Time 3: 100 days into Trump administration	0.336	0.033	5	< 0.001	-0.401	-0.271
Time 4: 10 post withdrawal from Paris Accord	0.280	0.031	-8.954	< 0.001	-0.341	-0.218

Pearson correlation between support for Trump and origin and impact beliefs, respectively, at each time point. Analyses were conducted using the R-based *cocor GUI package* (Diedenhofen and Musch 2015). Because we have independent samples for each time point, analyses included transforming the correlations using the Fisher's z transformation and calculating a difference between those z -scores (Diedenhofen and Musch 2015; Fisher 1925). The difference of z -scores was then compared with the critical region on the z -curve for a two-tailed test at the .05 alpha level. A confidence interval for the difference in correlations was calculated using Zou's (2007) method and then compared against a critical value of 0 (indicating a null hypothesis that the difference between correlations is 0). Both the Fisher's (1925) z -test and Zou (2007) test of confidence intervals suggest that for both origin

and impact climate beliefs, the correlations with support for Trump were significantly stronger at all three time points after the election compared with pre-election levels (see Table 3). No significant differences between correlations at Times 2, 3, and 4 (during the Trump administration) were found. This means that the negative association between climate beliefs and Trump support was significantly stronger after his election than pre-election levels and remained stronger during the earliest months of his presidency.

To further facilitate the interpretation of the interaction effect between time and support for Trump on climate beliefs, we visually inspected the mean levels of origin and impact climate beliefs at each time point (with Trump support split at ± 1 SD). Figure 2. shows that following his election, Trump's supporters seem to have experienced a decline in their climate change beliefs, which lasted throughout his presidency. Interestingly, Trump's influence on public climate beliefs may have also carried over to his opponents but in the opposite direction, as climate beliefs appear to have strengthened among those who do not support Trump. The overall widening gap between Trump's supporters and opponents is consistent for both origin and impact beliefs, except for the last time point: after withdrawing from the Paris Climate Agreement, Trump's supporters' impact climate beliefs seem to have rebounded back to their pre-election levels, while opponents' impact beliefs continued upward.

4.2 How climate beliefs translate into actions

Next, we tested how climate change beliefs relate to moral behavioral sentiments, and whether this, in turn, affects climate actions via conditional mediation analyses using the PROCESS macro for SPSS (Hayes 2017) with 50,000 bootstraps. Behavioral intentions to save energy to reduce climate change and support for the Paris Climate Agreement were the dependent variable, respectively. Support for Trump, time point, and their interaction were included as covariates to test the robustness of our model as to understand the impact of climate beliefs on climate actions via moral behavioral sentiments, regardless of in which time point the data were collected (pre-election or during the Trump administration) and whether or not respondents held a favorable impression of Trump.⁴

Climate beliefs interact to influence moral behavioral sentiments and climate actions We found a significant positive association between moral behavioral sentiments and both origin ($b = .576$, $se = .074$, $p < .001$) and impact ($b = .405$, $se = .083$, $p < .001$) climate beliefs. Importantly, as predicted (H2), these main effects are qualified by a significant interaction between origin and impact beliefs on moral behavioral sentiments ($b = -.043$, $se = .014$, $p < .001$; see Fig. 3). A simple slope plot based on ± 1 SD of origin and impact climate beliefs indicated that moral behavioral sentiments were strongest for those with both strong origin and impact climate beliefs, and those with relatively weak origin and impact beliefs reported particularly weak moral behavioral sentiments. This pattern is in-line with what we predicted. Unexpectedly, among those with one strong climate belief and one relatively weak climate belief (either origin or

⁴ Replication of the model testing with party affiliation and political orientation included as covariates produced a similar pattern of results, suggesting the model holds when including additional indicators of political preference that conceptually overlap with support for Trump. The pattern of results also holds when no covariates are included.

Table 3 Post hoc analyses: Comparison of correlations between Trump support and climate change beliefs at each time point, compared with pre-election correlation (i.e., Time 1 as reference)

Dependent variable: Origin climate belief					
	Pearson r	p-value	Fisher's z value	p- value	Zou's (2007) CI Lower bound Zou's (2007) CI Upper bound
Time 1: pre-election	-0.352	< 0.001			
Time 2: 20 days after inauguration	-0.500	< 0.001	2.641	0.009	0.038 0.258
Time 3: 100 days into Trump administration	-0.531	< 0.001	3.265	0.002	0.071 0.287
Time 4: 10 post withdrawal from Paris Accord	-0.538	< 0.001	3.405	< 0.001	0.079 0.293
Dependent variable: Impact climate belief					
	Pearson r	p-value	Fisher's z value	p- value	Zou's (2007) CI Lower bound Zou's (2007) CI Upper bound
Time 1: pre-election	-0.276	< 0.001			
Time 2: 20 days after inauguration	-0.426	< 0.001	2.471	0.014	0.031 0.268
Time 3: 100 days into Trump administration	-0.442	< 0.001	2.781	0.006	0.049 0.282
Time 4: 10 post withdrawal from Paris Accord	-0.399	< 0.001	2.017	0.044	0.003 0.242

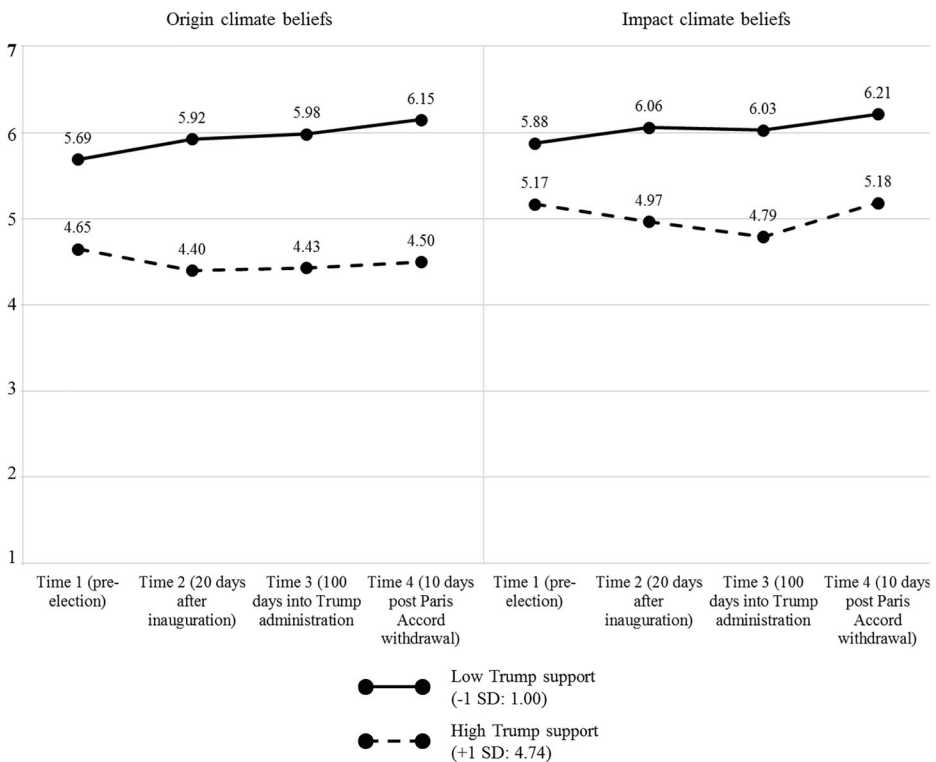


Fig. 2 Visualization of interaction between time point and support for Trump on average levels of origin and impact climate beliefs

impact beliefs, respectively), moral behavioral sentiments were still relatively strong, which suggests that strongly believing in one climate belief (i.e., either origin or impact belief) may help compensate for the other relatively weak climate belief these people held. Taken together, this pattern suggests having at least one strong climate belief may be sufficient to elicit moral behavioral sentiments, and having strong origin and impact beliefs was the most powerful combination for eliciting moral behavioral sentiments.

Similarly, we found significant positive associations between both origin and impact climate beliefs on intention to save energy ($b_{origin} = .980$, $se_{origin} = .074$, $p_{origin} < .001$; $b_{impact} = .720$, $se_{impact} = .083$, $p_{impact} < .001$) and support for the Paris Accord ($b_{origin} = .784$, $se_{origin} = .073$, $p_{origin} < .001$; $b_{impact} = .503$, $se_{impact} = .083$, $p_{impact} < .001$), respectively (before including moral behavioral sentiments in the model). Again as predicted (H2), these main effects were qualified by a significant interaction of origin beliefs and impact beliefs on both energy saving intentions ($b = -.094$, $se = .014$, $p < .001$) and support for the Paris Climate Agreement ($b = -.058$, $se = .014$, $p < .001$; see Fig. 3). The pattern of results was consistent with that found for moral behavioral sentiments: having at least one strong climate belief may be sufficient to motivate climate-friendly behavioral intentions and policy support, and as predicted, having both strong origin and strong impact beliefs was the most powerful combination for strengthening climate-friendly behavioral intentions and policy support.

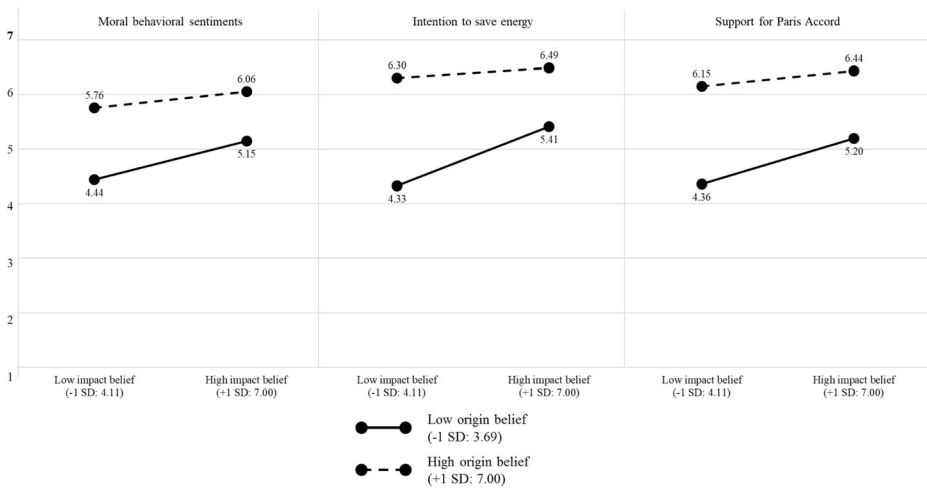


Fig. 3 Interactions of origin and impact climate beliefs on moral behavioral sentiments, intention to save energy to reduce climate change, and support for the Paris Climate Agreement. *Note: Interactions control for time point, support for Trump, and their interaction (see Table 4)*

Moral behavioral sentiments mediate the relation between climate beliefs and climate actions Importantly, as hypothesized, for both climate-friendly behavioral intentions ($b = -0.018$, $bootse = 0.007$, 95% CI $[-0.033, -0.004]$) and policy support ($b = -0.011$, $bootse = 0.005$, 95% CI $[-0.021, -0.003]$), we found significant conditional indirect partial effects (see Table 4) in the predicted direction. Meaning, moral behavioral sentiments partly mediate the effects of origin and impact climate beliefs and their interaction on both climate-friendly behavioral intentions and policy preferences, respectively (H3). Specifically, we found origin and impact climate beliefs interact to elicit moral sentiments about one's own environmental behavior. In turn, stronger moral behavioral sentiments were associated with stronger intentions to save energy to reduce climate change and increased support for the Paris Accord.

Importantly, our model accounted for over half the variance explained in climate-friendly behavioral intentions, $R^2 = 0.534$, and policy preferences, $R^2 = 0.618$. Furthermore, these effects were observed regardless of how much respondents supported Trump and at what time point they were interviewed (pre-election or during the Trump administration). Therefore, our model is robust at describing how climate change beliefs translate into individual behaviors and policy support.

5 Discussion

Our goals were to (1) understand the extent to which the election of a climate-skeptical president influences public climate beliefs, and (2) identify the psychological process through which climate beliefs may have “downstream” consequences for individuals’ climate-friendly behavioral intentions and policy support. Regarding the first research objective, we hypothesized that support for Trump and time of data collection (pre- and post-election) would interact such that support for Trump would predict weaker climate beliefs and that this relation would be stronger after Trump’s election compared with before (H1). Regarding the second research

Table 4 Pathway coefficients for conditional mediation model describing how origin and impact climate beliefs interact to influence behavioral intentions and policy preferences via moral behavioral sentiments

Behavioral intentions model results		Policy preferences model results									
Mediator (moral behavioral sentiments)		N = 1687					N = 1466				
		<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>		<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>	
Constant		1.307	0.430	3.041	0.003		1.317	0.439	2.997	0.003	
Origin climate belief		0.576	0.074	7.761	< 0.001		0.592	0.075	7.869	< 0.001	
Impact climate belief		0.405	0.083	4.871	< 0.001		0.412	0.086	4.804	< 0.001	
Origin climate belief X Impact climate belief (interaction)		−0.043	0.014	−3.057	0.003		−0.045	0.015	−3.081	0.002	
<i>Time point</i>		<i>−0.015</i>	<i>0.044</i>	<i>0.342</i>	<i>0.733</i>		<i>−0.007</i>	<i>0.045</i>	<i>−0.875</i>	<i>0.875</i>	
<i>Support for Trump</i>		<i>0.018</i>	<i>0.036</i>	<i>0.491</i>	<i>0.623</i>		<i>−0.002</i>	<i>0.039</i>	<i>−0.054</i>	<i>0.957</i>	
<i>Time X Support for Trump (interaction)</i>		<i>−0.013</i>	<i>0.013</i>	<i>−0.951</i>	<i>0.342</i>		<i>−0.008</i>	<i>0.014</i>	<i>−0.592</i>	<i>0.554</i>	
R²: 0.270							R²: 0.302				
Dependent variable (behavioral intentions to save energy)		<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>	Dependent variable (support for Paris Accord)	<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>	
Constant		−1.354	0.389	−3.486	< 0.001		0.160	0.409	0.391	0.696	
Moral behavioral sentiments		0.417	0.022	18.959	< 0.001		0.255	0.024	10.483	< 0.001	
Origin climate belief		0.740	0.068	10.870	< 0.001		0.633	0.071	8.869	< 0.001	
Impact climate belief		0.551	0.076	7.305	< 0.001		0.398	0.080	4.963	< 0.001	
Origin climate belief × impact climate belief (interaction)		−0.076	0.013	−5.897	< 0.001		−0.046	0.014	−3.432	< 0.001	
<i>Time point</i>		<i>0.036</i>	<i>0.040</i>	<i>0.898</i>	<i>0.370</i>		<i>0.179</i>	<i>0.042</i>	<i>4.238</i>	<i>< 0.001</i>	
<i>Support for Trump</i>		<i>−0.005</i>	<i>0.033</i>	<i>−0.162</i>	<i>0.872</i>		<i>0.0122</i>	<i>0.037</i>	<i>0.334</i>	<i>0.738</i>	
<i>Time × support for Trump (interaction)</i>		<i>−0.014</i>	<i>0.012</i>	<i>−1.143</i>	<i>0.253</i>		<i>−0.109</i>	<i>0.013</i>	<i>−8.335</i>	<i>< 0.001</i>	
R²: 0.534							R²: 0.618				
Index of moderated mediation		Index	boot	95% se	95% CI-LB	Index	boot	95% se	95% CI-LB	95% CI-UB	
		−0.018	0.007	−0.033	−0.004		−0.011	0.005	−0.021	−0.003	

Bold represents hypothesized model pathways; italics represent control variables

Coefficients for feelings about environmental behavior vary slightly due to missing data on support for Paris Accord measure

objective, we predicted that individuals' origin and impact climate beliefs would interact (H2) to influence climate actions via moral behavioral sentiments (H3).

First, as predicted, there was a negative association between climate beliefs and Trump support. The more people supported Trump, the weaker their origin and impact climate beliefs were, and conversely, the less people supported Trump, the stronger their climate beliefs were. Importantly, the interaction with time suggests this relation grew significantly stronger after his election and remained stronger than pre-election levels during his presidency once he had risen to political prominence and power. While our initial hypotheses primarily focused on Trump's influence among his supporters (c.f., Krosnick et al. 2000), our results suggest Trump's election influenced the broader public, with supporters reporting weaker climate beliefs and opponents reporting stronger climate beliefs after his election (compared with before his election), a pattern which was consistent for both origin and impact beliefs.

A noteworthy exception to the overall trend of a widening gap in Trump's supporters' and opponents' climate beliefs was the last time point when Trump withdrew from the Paris Climate Agreement. At this point, Trump's supporters' impact climate beliefs seem to have rebounded back to pre-election levels, while opponents' impact beliefs continued upward. This may be because prior to this point in time, people assumed Trump was a climate skeptic (Lehmann 2016; Matthews 2017), and yet, when discussing his decision to withdraw the USA from the Paris Accord, Trump emphasized his support for acting on climate change, that he personally cares deeply for the environment, and that the Paris Accord is simply a bad policy that requires re-negotiation (Trump 2017):

Therefore, in order to fulfill my solemn duty to protect America and its citizens, the United States will withdraw from the Paris Climate Accord ... but *begin negotiations to reenter* either the Paris Accord or a really entirely new transaction on terms that are fair to the United States, its businesses, its workers, its people, its taxpayers. So we are getting out. *But we will start to negotiate, and we will see if we can make a deal that's fair. And if we can, that's great. And if we cannot, that's fine...* Not only does this deal subject our citizens to harsh economic restrictions, *it fails to live up to our environmental ideals. As someone who cares deeply about the environment, which I do, I cannot in good conscience support a deal that punishes the United States — which is what it does — the world's leader in environmental protection...*

Note: *italics added for emphasis*

Given the strong influence Trump had on his followers' climate beliefs, especially post-election, it is possible Trump's supporters may have followed this change in messaging from their leader and adjusted their beliefs to align with his public statements on the topic.

These results support the notion that support for a political leader, in combination with the leaders' relative status, impacts the influence a leader has on public climate beliefs. Meaning, the election of climate-skeptical leaders, such as Trump, may be critical events in the political landscape for climate change beliefs (cf., Hahnel et al., accepted for this issue). Our findings are in-line with our theorizing based on social identity theory (i.e., Bouman and Steg 2019; Fielding and Hornsey 2016; Hahnel and Brosch 2016; Hogg et al. 2012) and leadership status research (i.e., Brauer and Bourhis 2006; Cialdini 2009; Nisbet and Kotcher 2009); thereby extending these lines of research by showing a leader's influence grows after being elected. We

theorize this change in influence is most likely because leaders gain status via political elections, but more research on what underlying mechanisms may drive this change in influence is needed. By examining the interaction of multiple factors that shape climate-skeptical leaders' influence on public climate beliefs, we gain a more nuanced theoretical understanding of who is most likely to be influenced by the election of such leaders and in what manner their climate beliefs may be swayed. Moreover, by gathering data around the election of a climate-skeptical leader, our results gain practical importance because we can observe how the theoretical relation between social factors (i.e., support for a leader) and climate beliefs may change as major political events (i.e., elections that change a leader's status) naturally unfold in the real world.

Second, our study extends the climate beliefs literature by showing that climate beliefs are not just multi-faceted independent predictors of climate actions (c.f., Leombruni 2015), but also interact with each other to influence moral sentiments about climate-related behaviors, behavioral intentions to act on climate change, and climate-friendly policy preferences. Specifically, we expected and found that a strong belief that climate change is a problem (i.e., strong impact belief) plus a strong belief that people are responsible for that problem (i.e., strong origin belief) may be a powerful combination for motivating people to take climate action. Consistently, the people that scored particularly low on moral behavioral sentiments, behavioral intentions to save energy, and support for the Paris Climate Agreement were those who held both relatively weak origin and weak impact climate beliefs.

Interestingly and unexpectedly, our results further suggest that either a relatively strong origin or impact climate belief may be sufficient to motivate climate actions, especially for origin belief. Weak impact beliefs exert little influence on sentiments and actions if origin beliefs are strong; and conversely, relatively weak origin beliefs exert little influence over sentiments and actions when impact belief is strong. This may be because there were very few people in our sample with truly weak climate beliefs (which is in-line with representative polling from the time, e.g., Brennan and Saad 2018; Leiserowitz et al. 2018). It is possible that the full interaction pattern we expected may occur for people with more strongly skeptical origin and impact climate beliefs, such as those who flatly deny human contributions to climate change or those who believe that a warmer climate will be beneficial. For example, if someone thinks people are responsible for causing climate change, but also simultaneously believes that a warmer climate will have overall beneficial impacts, they may be less likely to act than someone who has strong origin beliefs in combination with somewhat weak, but still generally negative, impact climate beliefs. To date, relatively few studies have examined whether climate-related beliefs interact to influence how people feel about and act on climate change (e.g., Mayer and Smith 2019, who examined interactions of climate risk perceptions). Our research therefore provides novel evidence that interactions are also present among the core, most well-established and commonly studied climate beliefs (i.e., that climate change is human-caused and will have negative impacts) and that they too influence each other's effects on climate-related sentiments and actions. Our results suggest it is important for researchers to measure the multiple aspects of climate change beliefs that can influence climate actions, and that simply measuring one belief will likely not provide full-insight into climate beliefs' influence on actions for everyone.

Third, our model offers insight into how climate beliefs may have consequences for climate-friendly actions. Specifically, as predicted, the relation between climate beliefs and climate actions was significantly mediated by moral behavioral sentiments, like feelings of guilt about not acting pro-environmentally and feeling that acting pro-environmentally makes

you a better person. Specifically, we found climate beliefs elicit moral sentiments about one's own climate-related behaviors, and those moral sentiments in turn motivate individuals' climate-friendly behaviors and policy preferences. This may be because feeling responsible for climate change or being concerned about its negative impacts may make people feel morally compelled to act. These findings are consistent with a growing body of literature which suggests the moral sentiments we feel about our climate behaviors help translate more general predictors of behavior, like beliefs, into concrete climate-friendly behaviors and policy support (e.g., Bamberg and Möser 2007; Bouman et al. 2020; Dietz et al. 2007; Harland et al. 1999; Steg et al. 2011).

Importantly, the results of our model held, regardless of whether and when people's climate beliefs were influenced by Trump's election. This means our theorized process was supported consistently for both supporters and opponents of Trump and at all time points we collected data (pre- and post-election). Taken together, our results offer preliminary evidence that the election of a climate-skeptical political leader as President of the USA may have influenced the public's climate beliefs, which in turn may have impacted the moral sentiments they felt about their own behavior, and ultimately, their climate actions.

5.1 Limitations and future directions

Given that our data was sourced via MTURK, our study employed an adult convenience sample, and therefore may be somewhat limited when it comes to generalizability to the population of the USA (Berinsky et al. 2012). Indeed, reflecting established left-leaning biases within MTURK (c.f., Clifford et al. 2015), our sample was comprised of roughly two-thirds liberals, which means the most staunch conservatives are likely under-represented in our sample. However, we focused on the relationships between variables (rather than describing the US population), which means it is not a statistical requirement of our modeling that the sample is fully representative. Instead, it is more important that our sample contain sufficient variance to perform these analyses and draw robust conclusions, conditions which our data satisfied. Furthermore, the results remained significant even when controlling for relevant political identity factors which could influence the relations we examined in this study, like support for Trump, so we can have some assurance that we would likely find a similar pattern of results regardless of means changing due to representativeness of sample. Moreover, the means patterns we observed in origin and impact climate beliefs were in-line with representative polling conducted at the time of our study which found that that conservatives' concern about climate change declined after Trump's election and liberal's climate concern has increased (Johnson and Schwadel 2019; Leiserowitz et al. 2018; Schwartz 2019). These representative-sample poll results parallel the widening belief gap we observed among Trump's supporters and opponents, lending further support to the generalizability of our results despite sampling limitations.

By capturing these real-world events as they unfolded, our data have high ecological validity. However, we employed a pooled cross-sectional approach to analyzing differences over time with four independent samples, which means our inferences are limited to correlations, and therefore causality cannot be inferred. We cannot be sure if there is some lingering unaccounted-for artifact that may drive the observed relations between support for Trump and time on origin and impact climate beliefs. However, our results parallel those of Hahnel et al. (2019) who found similar effects using within-participants pre- and post-election data, giving more confidence to the conclusions we can draw from our findings. It is important to triangulate findings across multiple methods, as together, the conclusions drawn from multiple independent studies are more robust than conclusions

that can be drawn from a single study. Despite the limitations in causal inferences, by using independent samples in our study, we can be sure that our results are not the product of testing effects or respondents' familiarity with our questionnaire and research questions. Importantly, even with the additional error variance and statistical "noise" caused by analyzing pooled independent samples, we were still able to find large effects that explained over half the variance in both climate-friendly behavioral intentions and policy support.

Our results and those from similar studies (i.e., Hahnel et al. 2019) are theoretically and practically important, and more research is needed to improve our causal understanding of the following: to what extent and why supporters' climate-related beliefs align with political leaders' opinions; why that alignment may change when the leader rises to power; and how these changes in climate beliefs ultimately affect climate actions and policy support. Additionally, as climate change becomes an increasingly urgent and more frequently debated political topic, it is important to examine how the rise of *climate-friendly* political leaders influences public engagement with climate change and whether that influence occurs through a similar process observed here.

6 Conclusion

In sum, we found that climate beliefs are influenced by the political leaders people support and oppose, and that the influence political leaders exert on public climate beliefs depends not only on the extent to which people support the leader but also on the status the leader holds within a group. As that status grows, like when a leader wins an election, his/her influence on public climate beliefs grows stronger. Furthermore, we found that strong climate beliefs (both independently and combined) can motivate climate-friendly behavioral intentions and policy support by eliciting moral sentiments about climate behaviors. Conversely, climate-related moral sentiments, behavioral intentions, and policy support are particularly low when both climate beliefs are relatively weak. Moreover, moral behavioral sentiments act as translators, mediating the relation between general climate beliefs and concrete climate actions. Hence, our results offer preliminary evidence Trump's election as President of the USA may have changed what the American public believed about climate change, which, in turn, may have impacted the moral sentiments they felt about their own pro-environmental behavior, and ultimately, their climate-related behaviors and policy preferences.

Our findings support the notion that environment-related political leadership in the USA can be a potentially powerful force for shifting public engagement with climate change, and the environment more broadly (Dietz et al. 2015). Furthermore, our findings emphasize the growing need to account for political contexts' influence on individuals' contributions to environmental sustainability, as well as the processes through which political leaders and their rise to power influence the public's engagement with the climate. As both climate-skeptical and climate-friendly leaders come to the forefront of the political landscape, their potential to rally public support for or against climate actions may be vital to successfully addressing today's most pressing environmental challenges.

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Author contributions S.J.Z. co-implemented the questionnaire studies, conducted all statistical analyses, and led the drafting of the manuscript. T.B. designed and co-implemented the questionnaire study, and L.S. oversaw study and questionnaire design. V.B. and P.B.D. co-implemented data collection and analysis. All authors contributed to writing the manuscript and approved its final version for submission.

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